Water Use Efficiency Proposal

Development of Water Conservation Curriculum

Contents

Introduction

Long term water conservation can be achieved by employing best practices in irrigation of both agricultural crops and ornamental landscapes. A key strategy in improving irrigation practice is to improve the instruction in irrigation in secondary and community college agriculture programs. Students in these programs not only will work in the agricultural industry, but also will become homeowners and community members.

Developing quality materials that can be easily integrated in existing courses by teachers in the areas of irrigation system auditing (evaluation), scheduling, and management will have the most direct effect on water conservation. These areas are applicable to both agricultural crops and ornamental landscapes. Much of the materials are already available, but in formats that are not conducive to adoption by teachers. Materials are often at an inappropriate level, difficult to comprehend, or in formats that are not easily adaptable to instruction. This project will develop such materials for use at various levels that include complete activities, multimedia, and training for delivering quality instruction to improve water conservation.

A key component of the project is to provide teacher support through training and education. The project will provide a structure for ongoing, high quality workshops that follow the train the trainer approach. Project staff and field experts will also help teachers implement the curriculum. Teachers will be more likely to adopt new curriculum if they are supported. The workshops will guide the teacher through the curriculum, but also provide hands on activities and sample demonstrations that they can use to reinforce key concepts.

Project Information Form

Applying for: ☐ Urban ☑ Agricultural

1. (Section A) **Urban or Agricultural Water Use Efficiency Implementation Project**
   - ☐ (a) implementation of Urban Best Management Practice, #_____
   - ☐ (b) implementation of Agricultural Efficient Water Management Practice, #_____
   - ☐ (c) implementation of other projects to meet California Bay-Delta Program objectives, Targeted Benefit # or Quantifiable Objective #, if applicable _____
   - ☐ (d) Specify other: _____

2. (Section B) **Urban or Agricultural Research and Development; Feasibility Studies, Pilot, or Demonstration Projects; Training, Education or Public Information; Technical Assistance**
   - ☐ (e) research and development, feasibility studies, pilot, or demonstration projects
   - ☑ (f) training, education or public information programs with statewide application
   - ☐ (g) technical assistance
   - ☐ (h) other

3. Principal applicant (Organization or affiliation): CSU, Chico Research Foundation

4. Project Title: Development of Water Conservation Curriculum

5. Person authorized to sign and submit proposal and contract:

Name, title	Jeff Wright Director, Sponsored Programs
Mailing address	Office of Sponsored Programs Building 25, Chico CA 95929-0870
Telephone	530-898-5700
Fax.	530-898-6804
E-mail	jdwright@csuchico.edu

6. Contact person (if different):	Name, title.	Mike Speiss, Assoc. Professor
	Mailing address.	CSU, Chico Chico, CA 95929-310
	Telephone	530-898-4554
	Fax.	
	E-mail	mspiess@csuchico.edu
7. Grant funds requested (dollar amount): *(from Table C-1, column VI)*		**$186,218**
8. Applicant funds pledged (dollar amount):		N/A
9. Total project costs (dollar amount): *(from Table C-1, column IV, row n)*		**$186,218**
10. Percent of State share requested (%) *(from Table C-1)*		N/A
11. Percent of local share as match (%) *(from Table C-1)*		N/A
12. Is your project locally cost effective? *Locally cost effective means that the benefits to an entity (in dollar terms) of implementing a program exceed the costs of that program within the boundaries of that entity.*		❑ (a) yes
(If yes, provide information that the project in addition to Bay-Delta benefit meets one of the following conditions: broad transferable benefits, overcome implementation barriers, or accelerate implementation.)		☑ (b) no
11. Is your project required by regulation, law or contract? If no, your project is eligible. If yes, your project may be eligible only if there will be accelerated implementation to fulfill a future requirement and is not currently required. *Provide a description of the regulation, law or contract and an explanation of why the project is not currently required.*		❑ (a) yes ☑ (b) no
12. Duration of project (month/year to month/year):		12/2005-11/2008

13. State Assembly District where the project is to be conducted:	3rd District –*Headquarters for project-various other Districts will be involved.
14. State Senate District where the project is to be conducted:	1st District*see note above
15. Congressional district(s) where the project is to be conducted:	2nd District*see note above
16. County where the project is to be conducted:	Butte County
17. Location of project (longitude and latitude)	Statewide
18. How many service connections in your service area (urban)?	N/A
19. How many acre-feet of water per year does your agency serve?	N/A

20. Type of applicant (select one):

- ❑ (a) City
- ❑ (b) County
- ❑ (c) City and County
- ❑ (d) Joint Powers Authority
- ❑ (e) Public Water District
- ❑ (f) Tribe
- ☑ (g) Non Profit Organization
- ❑ (h) University, College
- ❑ (i) State Agency
- ❑ (j) Federal Agency
- ❑ (k) Other
  - ❑ (i) Investor-Owned Utility
  - ❑ (ii) Incorporated Mutual Water Co.
  - ❑ (iii) Specify _____

21. Is applicant a disadvantaged community? If 'yes' include annual median household income.

(Provide supporting documentation.)

- ❑ (a) yes, _____ median household income
- ☑ (b) no

Signature Page

By signing below, the official declares the following:

The truthfulness of all representations in the proposal;

The individual signing the form has the legal authority to submit the proposal on behalf of the applicant;

There is no pending litigation that may impact the financial condition of the applicant or its ability to complete the proposed project;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant;

The applicant will comply with all terms and conditions identified in this PSP if selected for funding; and

The applicant has legal authority to enter into a contract with the State.

_____	Jeff Wright, Director-Sponsored Programs	_____
Signature	Name and title	Date

Statement of Work

Relevance and Importance

Community College and Secondary agriculture programs in California include growing of both food crops and ornamentals. Current research has shown that education is an effective tool in promoting conservation when students are actively involved in the lessons[1]. Research has also shown that the most lasting changes in curriculum redesign are the result of the following: (1) delivery of essential content-based curriculum aligned to current standards, (2) use of appropriate instructional lesson design strategies ranging from intense, direct instruction to project-based investigations, and (3) continuous assessment and adaptation of curriculum and pedagogy and over time through ongoing professional collaboration. Additionally, the lack of high quality and easy to use materials is seen as a barrier to the delivery of irrigation best practices education. While curriculum outlines are available at both levels, they may omit current best practices and do not provide the instructor with the tools to deliver the materials.

High school agriculture programs serve over 60,000 students in California and instruction is delivered by 670 teachers at 330 high schools[2]. Irrigation is part of the Basic Core curriculum (see Appendix A, or at http://www.calaged.org/ResourceFiles/Curriculum/curriculum.htm) taught to 17,259 students, Ornamental Horticulture curriculum (9,005 students), and Plant Science curriculum (2,196 students). The current curriculum does not adequately cover current best practices in irrigation audit and management, nor does it provide useable classroom materials in these areas. The curriculum materials proposed in this project will create curriculum materials compatible with and referenced to this existing curriculum. The curriculum and materials will also support the existing and draft Agricultural Content Standards published by the California Department of Education. Teacher preparation programs do not require an irrigation course and the majority of high school agriculture teachers have not taken one. Teachers are more likely to adopt a curriculum if they don't have to develop their own classroom materials. The map below shows the distribution of the high school programs in California. The majority of programs are in the Cal-Fed area and most serve communities with low incomes and high minority populations.

Currently many homeowners have sprinklers systems that are not aligned correctly or watering of their yard is not scheduled to maximize irrigation efficiency. This is a waste of water that could easily be saved if the homeowner had some education on how to properly schedule irrigation in relation to their plant material, soil, irrigation system and ET data for their area. By auditing a homeowners landscape irrigation system we would be able to establish the current state of water usage by that homeowner and then make suggestions as to water savings. Auditing is also an appropriate activity for agricultural crop irrigation systems but it is expected that scheduling and management (operation) will be more important in water conservation education. The concepts of auditing, scheduling, and management are the same for both agricultural crops and ornamentals. Activities based on the examples in one area can be used in the other (ex. scheduling turf grass uses the same concepts as scheduling almonds).

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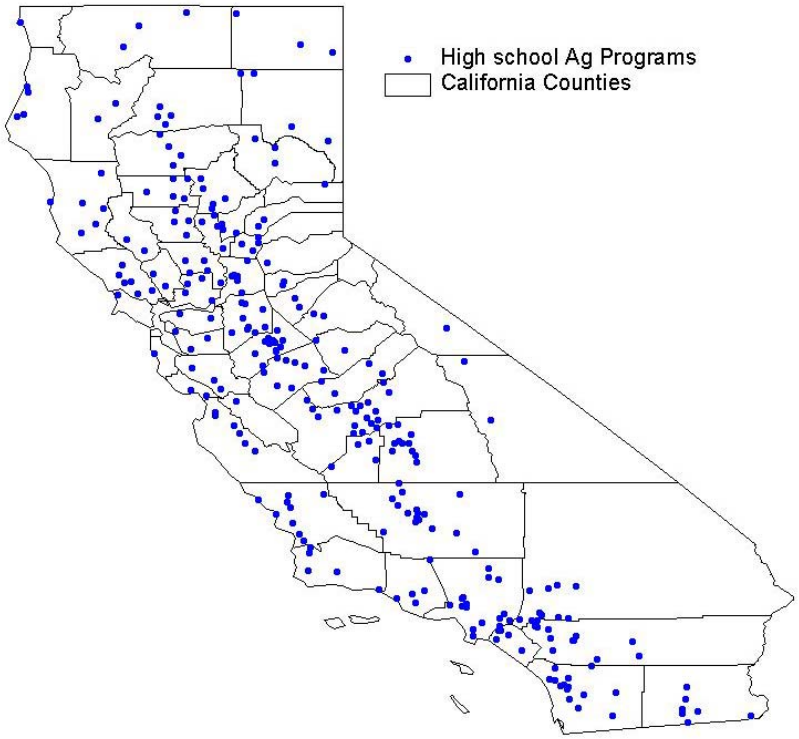
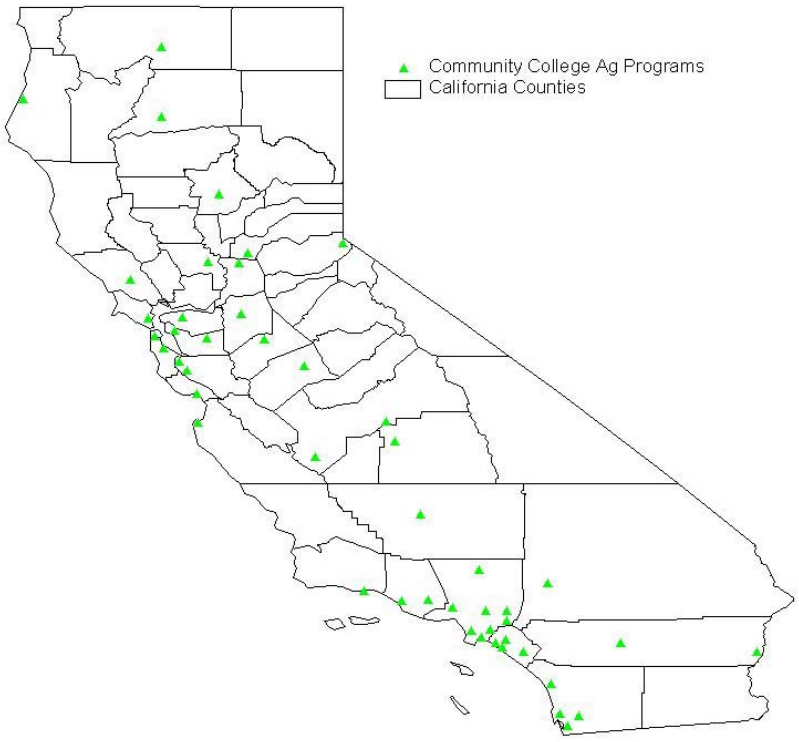
1 Educational Interventions That Improve Environmental Behaviors: A Meta-Analysis. Zelezny, Lynnette C.; Journal of Environmental Education, v31 n1 p5-14 Fall 1999

[2] California Department of Education, 2004. Available at: http://www.calaged.org/r2



Location of California Secondary Agriculture Programs

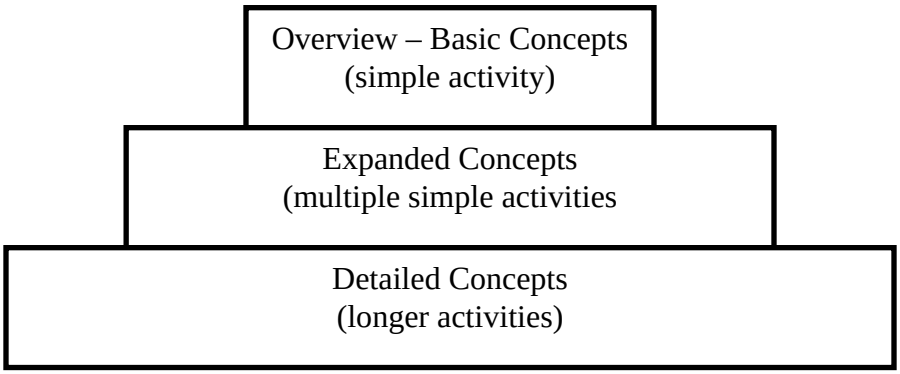
According to the Community College Chancellors office there are 40,000 students enrolled in Agriculture programs at the community college level. The curriculum of the thirteen Community colleges in the Central Valley that teach agriculture was reviewed. Five of the 13 did not have a specific irrigation class, but do offer plant science or horticulture classes that could use irrigation curriculum. The remaining eight offer an irrigation course(s) that could benefit from high quality irrigation curriculum materials. The Community College Agriculture Course Articulation Numbering System (http://www.ccagcans.com/) provides standardized curriculum for irrigation in both the crop and landscape areas (CCAG 650 Irrigation and CCAG 355 Landscape Irrigation). See Appendix B for course outlines. Irrigation is also a topic included in other plant science and horticulture courses. The materials will be compatible with and referenced to the CCAG curriculum. Materials will be made available (via the Web), allowing teachers (and others) to use them even if teachers are unable to participate in a workshop.



Location of California Community College Agriculture Programs

Technical/Scientific Merit & Feasibility

The main focus of this grant is to develop curriculum and teacher support for Secondary School Agriculture and Science classes and Community College Agriculture and Environmental Horticulture programs in California. Curriculum will have three areas: Irrigation System Auditing and Evaluation, Irrigation Scheduling, and Irrigation Management and Conservation. Instruction material will be developed and assembled in easy-to-use teaching modules. The modules will be designed in three tiers (as shown in the Figure below.)



Three Tier Approach to Curriculum Materials Development

Modules will be bundled such that instructors can choose the level appropriate for their class; from basic concepts for secondary school to more in depth laboratories for community college irrigation courses. All of the material will be packaged in binders; including laboratory exercises and PowerPoint presentations. Curriculum will be created to encourage community outreach, such as a program for FFA students to perform landscape irrigation audits for community households. Modified curriculum materials will also be offered to grade school programs through Ag in the Classroom and similar programs. Grade school curriculum will be cross-referenced to the K-12 science and math standards published by the California Department of Education.

The main purpose of this project is to make available resources that are already out there, but are not in an easy-to-use format. More agriculture programs would offer either irrigation courses or cover irrigation in other classes if there were materials available that were ready-to-go.

Irrigation system evaluation toolboxes will be created and distributed to workshop participants. These ready-to-use toolboxes will have the materials necessary for conducting irrigation system evaluations. This will allow institutions without equipment to conduct evaluations for hands-on irrigation laboratories. The toolbox will include equipment such as: pressure gauge, pitot tube, soil probe, catch cans, measuring tape, flags, multi media lessons, units and activities. These toolboxes will be an inexpensive laboratory that will allow instructors to easily integrate irrigation best practices into their curriculum.

Workshops will be conducted to disseminate curriculum materials and toolkits to secondary and post secondary instructors. Three, regional, two-day workshops will be held in the north, central

and south Central Valley. Each workshop will be open to twenty participants; who will receive a toolbox and training on all of the teaching modules. These workshops will be held at participating community colleges or institutions. Additional half day workshops will be conducted at the California Agriculture Teachers Conference, Community College Mid Winter Institute and other regional meetings. These workshops will be convenient for the fact that a large number of educators will be available for distribution of materials. Binders with ready-to-go lectures, activities and laboratories will be given to participants. These binders will include interactive PowerPoint presentations. In addition notes will be added on how to assemble inexpensive laboratory demonstrations and how to set up hands-on activities

As a community outreach effort, web-site material will be developed that community members (for instance, families in the communities served by agriculture programs) could access for water conservation and management information. A main focus for this web-site would be for individuals to sign-up for emailed irrigation clock updates, both for landscape and selected agricultural crops. An email ET application will be created that will send data to subscribers with the ET in terms easily understood, such as run time. This weekly email will remind the subscriber to adjust their watering schedule in relation to the changing weather conditions. For example a homeowner would enter the type of landscape and irrigation system they have and a weekly update would be emailed listing ET and irrigation schedule. The email application will be available in all areas served by CIMIS weather stations. The existing Wateright.org site will be used as a base for expanded online tools. Additional websites will be utilized, such as: http://www.CalAgEd.org (California Agricultural Education) and http://www.calagcc.com (Community College Agriculture).

Activity (use) of the web-site will be used in the evaluation of the program. Starting the third year of the project the database of participants will be used to conduct an annual survey to asses the effectiveness of the program. Subscribers will be asked how the program is working as well as how much water they were previously using and how much they are using now, in order to determine the conservation obtained.

Tasks

Task Number	Task	Deliverables	Start	End
1	Initial Startup, Administration & Planning, Assessment	Interim and Final Reporting	Dec-05	Nov-08
2	Development of Audit, Scheduling, and Management Curriculum	Audit, scheduling, and management curriculum materials	Jan-06	Jul-08
3	Workshops, Training, and Outreach Activities	Presentation of curriculum & distribution of curriculum materials at 3 workshops, 4 conferences, 3-6 meetings	Jun-06	Nov-08
4	Follow-up 5 Year Survey		6/2010	11/2010

Monitoring and Assessment

The principals of the project are located on three separate college campuses. To reduce grant costs and improve collaboration the principals will use email and video conferencing (available on each campus) to conduct regular meetings and monitor the progress of the grant. Previous experiences (precision agriculture grants with Fresno State, UC Davis, and Cal Poly, SLO) have shown that video conferencing to be a very effective means of communication and collaboration.

The assessment of this project will be accomplished the following ways:

Participants of each of the three regional training workshops and the mini-workshops will be asked to fill out an evaluation of the training and curriculum. A follow-up evaluation will be conducted after each workshop with surveys emailed to workshop participants to determine the usefulness of the material for incorporating into their curriculum and the effectiveness of the implemented program at the community level.

1. A website for community members receiving the training will be developed for them to access data on water management. At this website they will be able to sign-up for an email subscription that will send local ET data and a recommendation for water management out weekly or monthly. This regular email will remind the subscriber to adjust their watering schedule in relation to the changing weather conditions. Starting the third year of the project an annual survey would be sent to all participants through email to see how the program was working and how much of a water savings each household has experienced. The data collected through this survey would be used to asses the success of the project.
2. A follow up of the results from the audits preformed by High School and Community College Agriculture/Horticulture students would be included in the final report. Recommendation would be made to homeowner as to what could be done to improve the efficiency of their water system as a result of this audit.
3. Analysis of the use of web based tools will also be performed.

All data collected though evaluations and surveys will be summarized and included in the interim and final reports done to DWR.

Qualification of the Applicants and Cooperators

Applicants

The principals in this project all have extensive irrigation experience ranging from system design, to research, to evaluation and management. Additionally they teach irrigation and have a comprehensive understanding of what it takes to deliver quality irrigation instruction. (See Appendix C for applicant resumes.). Both West Hills College and California State University, Chico has on-going water conservation grants from the Bureau of Reclamation and Workforce Development.

Dr. Michael Spiess, Associate Professor
College of Agriculture
California State University, Chico
Chico, CA 95929-0310

Clint Cowden, Instructor
Joy Cowden
West Hills College
300 W. Cherry Ln.
Coalinga, CA 93210

Leimone Waite, Instructor
Shasta College
11555 Old Oregon Trail
P.O. Box 496006
Redding, CA 96049-6006

Cooperators

We have several partners who are offering to assist with this project by providing technical expertise, materials, curriculum review, and material dissemination. Organizations such as California Ag in The Classroom and The Irrigation Association have agreed to support the project. In addition the following individuals will help with the project.

Dr. Stewart Styles, Director
Irrigation Training and Research Center
Cal Poly San Luis Obispo
1 Grand Ave
San Luis Obispo, CA 93407

Butte College
3536 Butte Campus Dr.
Oroville, CA 95965

Larry Rohlfes, CAE
Assistant Executive Director.
California Landscape Contractors Association
1491 River Park Drive, Suite 100
Sacramento, CA 95815

Dr. David Zoldoske, Director
Center for Irrigation Technology
California State University, Fresno
Fresno, CA 93740

Dr. Jerry Valadez
K-12 Science Coordinator
Director-After School Programs
Fresno Unified School District
3132 E. Fairmont, Building 5
Fresno, CA 93726

Mr. Tip Wilmarth, Horticulture Instructor

Innovation

Irrigation evaluation and scheduling are complex topics. One of the barriers to delivering quality instruction for high school and college instructors is the lack of quality materials. This is particularly true when the material is only a unit in a larger curriculum. The goal of this project is to produce materials packaged in such a way that teachers can use them as is at a variety of levels as well as incorporate selected elements into existing courses. All elements of this project utilize computer technology. Materials will be provided in electronic format so that they can be modified by teachers as needed. High quality still and animated graphics will be created to simplify complex concepts like DU. Lesson materials will be created in several mediums such as MPEG, PowerPoint, as well as Word and PDF documents. The project will make extensive use of the World Wide Web. The existing Wateright.org site will be used as a base for expanded online tools that can be used by the public as well as an integral part of the curriculum materials.

Part of the web application will be to develop an email ET application that will send an email to subscribers with the ET in terms easily understood like run times. This application will be integrated into curriculum activities that can be used at a variety of levels and also be available to the general public (like families in the communities served by agriculture programs). The email application will be available in all areas served by CIMIS weather stations.

Outreach, Community Involvement and Acceptance

This project is based on outreach and community involvement. The first part of our project would include developing curriculum for Community College and Secondary School Agriculture and Horticulture classes. The Curriculum would include multimedia lessons and activities related to water savings in the landscape and agriculture field. With such topics as: Better Water Management, How to Perform a Water Audit, Setting the Time Clock Based on Local ET Data, Scheduling for Maximum Watering Efficiency, Ways to Conserve Water With Surface Irrigation, micro-irrigation and Soil, Plant and Water Relationships. The curriculum developed from this project would be packaged in a binder that would include power point lessons for each unit and detailed activity plans and labs.

The second part of the project would be to develop a toolbox that we would give to each of the workshop participants. This toolbox would then be used by students to perform irrigation audits within their communities. This toolbox could also be used on school campuses to perform audits and be utilized for many Irrigation Lab activities.

The third part of the project would be to offer workshops to High School and Community College Agriculture and Horticulture Teachers. These workshops would be held throughout the Central Valley and at events where High School and Community College Teachers were already attending so as to reach the maximum number of instructors as possible. We would also present a “Make and Take” workshop at the Ag in the Classroom conference for grade school teachers who would like to incorporate water conservation education into their instruction.

The forth part of this project would involve the teachers who completed the workshops taking the information back to their students and training them to perform water audits for homeowners in the community and to teach people in the community how to conserve water in their landscapes. Students could perform this community service as part of the service learning component of the FFA that is an integral part of High School Agriculture programs or through Agriculture or Horticulture Clubs in the Community College. There are currently 60,000 FFA members in California and 40,000 students enrolled in agriculture programs at the Community College level. If this project only included one fifth of these students we would have the potential of impacting thousands of community members throughout the Central Valley.

In addition to students going out to community member’s yards, instructors at the Community Colleges could also offer free classes to the community that their college district serves. The majority of the schools that would potentially participate are in poor rural communities with residents who could never afford to pay for their system to be audited.

The last part of the project would include the development of a website that community members could access for water conservation and management information. From this website they could sign up to receive a free email each week that would inform them of local ET data and give them a recommendation for water scheduling.

Benefit/Cost

Due to the nature of this project the outcome/benefits cannot be listed (in a table C-5) in a quantitative way. However, the outcome is a curriculum and related materials that can be easily adopted at both the K-12 and post secondary levels. Research has shown that education is an effective strategy to improve conservation habits. The project will provide workshops to help teachers implement the curriculum helping to insure that the curriculum is adopted. The project has the potential to impact students, their communities, and the agricultural industry long past the duration of the project as the materials are used by teachers in their classrooms.

Budget

Task Budget

The estimated budget by task is shown below. Refer to the Statement of Work for a description of the tasks and related deliverables.

Task Number	Task	Budget Components	Total
1	Initial Startup, Administration & Planning, Assessment	Administration (a), Reporting (m), Monitoring and Assessment (l), and Indirect (k) are included in this task. Costs for this task include labor & fringe benefits, supplies, computer equipment for development and presentation, and travel expenses for planning meetings.	$21,955
2	Development of Audit, Scheduling, and Management Curriculum	Planning and Design (b) and Indirect (k) are included in this task. Costs for this task are primarily labor & fringe benefits, but also include travel (meetings), supplies, and consulting services (Web site, programming, illustration, and animation services)	$82,555
3	Workshops, Training, and Outreach	Implementation (d) and Indirect (k) are included in this task. Costs for this task are labor & fringe benefits, travel (workshops and meetings), supplies (curriculum and demonstrations materials, toolboxes), equipment (demonstration materials) and consulting services (guest speakers)	$81,708
	TOTAL		$186,218

Annual Budget

Approximate distribution of the budget for each year will be:

Year	Amount
1	$74,450
2	$55,884
3	$55,884
TOTAL	$186,218

Summary Budget

	Category (I)	Project Costs $ (II)	Contingency % (ex. 5 or 10) (III)	Project Cost + Contingency $ (IV)
	Administration[1]			
	Salaries, wages	$5,600	0	$5,600
	Fringe benefits	$952	0	$952
	Supplies	$6,500	0	$6,500
	Equipment	$0	0	$0
	Consulting services	$0	0	$0
	Travel	$500	0	$500
	Other	$0	0	$0
(a)	Total Administration Costs	$13,552		$13,552
(b)	Planning/Design/Engineering	$68,796	0	$68,796
(c)	Equipment Purchases/Rentals/Rebates/Vouchers	$0	0	$0
(d)	Materials/Installation/Implementation	$68,090	0	$68,090
(e)	Implementation Verification	$0	0	$0
(f)	Project Legal/License Fees	$0	0	$0
(g)	Structures	$0	0	$0
(h)	Land Purchase/Easement	$0	0	$0
(i)	Environmental Compliance/Mitigation/Enhancement	$0	0	$0
(j)	Construction	$0	0	$0
(k)	Other (Indirect 20%))	$31,036	0	$31,036
(l)	Monitoring and Assessment	$2,372	0	$2,372
(m)	Report Preparation	$2,372	0	$2,372
(n)	**TOTAL**	$186,218		$186,218
(o)	Cost Share -Percentage			

Attachment A California High School Agriculture Curriculum

Basic Core (Unit Level)

CLF350

- - AGRICULTURE CORE CURRICULUM - -

(CLF300) Core Area: PLANT SCIENCE

(CLF350) Unit Title: IRRIGATION

UNIT DIRECTORY:

Code	Topic Title	Hours	Year(s)
(CLF351)	Irrigation Systems	2	1
(CLF352)	Irrigation Terminology	3	2
(CLF353)	Knowing when to Irrigate	2	1
(CLF354)	Water Measurement and Soil Capacity	1	2
(CLF355)	Irrigation Practices	1	1
	TOTAL TIME FOR UNIT = 9		

UNIT GOAL: Students shall understand growth and development of plants, including the functions of plant parts, reproductive systems and auxins.

UNIT OBJECTIVES: Upon completion of this unit, the students will be able to:

1. Name four types of irrigation systems.
2. Demonstrate two methods of irrigation in a plant.
3. Define and explain, field capacity, saturation, wilting point, permanent wilting point and available water.
4. Explain three ways of determining when to irrigate.
5. Explain (and demonstrate) the concept of water holding (or field) capacity of different soils.
6. Discuss acre inch, acre foot, water penetration and water holding

capacity.

7. Discuss the importance of choosing land for irrigation, obtaining water, water quality and the importance of drainage.

350.1

REFERENCES

Halfacre and Barden. (1979) HORTICULTURE San Francisco, CA: McGraw-Hill Co.

Hartman, Kofraneck, Rubatzk, and Plocker. (1988). Plant Science (second edition). Englewood Cliffs, NJ: Prentice-Hall.

Janick, Schery, Woods, and Ruttan. (1981). PLANT SCIENCE (third edition). San Francisco, CA: W. H. Freeman.

Strong. (1956) Sprinkler Irrigation Manual. England: Wright Rain & Ringwood.

Weaver, R. J. (1976). GRAPE GROWING New York, N.Y.: J. Wiley & Sons Inc.

RESOURCES

California Department of Water Resources: wwwdwr.water.ca.gov/

Creative Educational Videos, Agriculture Technology & Industrial: www.cev-inc.com 800-922-9965

Educational Resources: www.edresources.com

Texas A&M Instructional Materials Services: www-IMS.tamu.edu/catalog.htm

Ohio Agricultural Education Curriculum Materials Service, Ohio State: www-cms.ag.ohio-state.edu

Plant Science Curriculum (Unit Level)

- - AGRICULTURE CORE CURRICULUM - -

(CLF7000) Advanced Core Cluster: PLANT SCIENCE AND SOIL SCIENCE

(CLF7550) Unit Title: IRRIGATION

UNIT DIRECTORY:

Code	Topic Title	Hours	Year(s)
(CLF7551)	Irrigations and Drainage	5	3 / 4
(CLF7552)	Irrigating	4	3 / 4
(CLF7553)	Irrigation Measurements	4	3 / 4
(CLF7554)	Soil Water	4	3 / 4
	TOTAL TIME FOR UNIT =	17	

UNIT GOAL: Students will demonstrate basic knowledge of common management practices used in irrigation and drainage.

UNIT OBJECTIVES: Upon completion of this unit, the students will be able to:

1. Define the terms irrigation and drainage.
2. List sources of irrigation water.
3. Compare differences in water holding capacities and water infiltration rates of fine and coarse soils.
4. Name and describe two common drainage systems.
5. Describe factors that determine water penetration.
6. Design and demonstrate the set up of two types of irrigation systems.
7. Identify three ways of determining when to irrigate.
8. Describe how sprinkler irrigation can work as a frost protection method.
9. Given the appropriate information, calculate the appropriate amount of water needed and the cost for that water for a complete production cycle of a major local crop.

10. Determine the acre feet of water needed to irrigate a local crop.

11. Describe how and why salts (e.g. selenium and nitrate ions) can become a problem in agricultural waste water run-off.

12. Discuss how water in soil can move upward against gravitational pull.

13. Demonstrate how to test for soil moisture content by touch.

14. Calculate soil moisture content.

REFERENCES:

American Society of Agronomy,. (1988). CROPPING STRATEGIES FOR EFFICIENT USE OF WATER AND NITROGEN. Madison, Wisconsin.

Brady, Nyle C. THE NATURE AND PROPERTIES OF SOILS. (9th ed.). New York: MacMillan Publishing Co.

Donahue, Roy L. (1983). SOILS. (5th ed.). Englewood Cliffs, New Jersey: Prentice Hall, Inc.

Hartman, Hudson. (1988). PLANT SCIENCE. (2nd ed.). Englewood Cliffs, New Jersey: Prentice Hall, Inc.

Russ, Norm. (1974). STANISLAUS ORCHARD HANDBOOK. 1212 J St. Modesto, California: The Ink Spot.

Salinity/Drainage Task Force. (1988). RESOURCES AT RISK. University of California: Agricultural Issues Center (and Water Resources Center), Cooperative Extension.

University of California. (1982). FROST PROTECTION FOR NORTH COAST VINEYARDS. Leaflet 2743.

RESOURCES:

Curriculum Development Project. (1989) LESSON PLANS FOR THE BASIC CORE CURRICULUM. DAVIS, CALIFORNIA: Agricultural Education Program, University of California, Davis

Ornamental Horticulture (Unit Level)

- - AGRICULTURE CORE CURRICULUM - -

(CLF6000) Advanced Core Cluster: ORNAMENTAL HORTICULTURE

(CLF6450) Unit Title: IRRIGATION AND DRAINAGE

UNIT DIRECTORY:

Code	Topic Title	Hours	Year(s)
(CLF6451)	Irrigating Ornamental Plantings	1	3 / 4
(CLF6452)	Drainage	1	3 / 4
(CLF6453)	Sprinkler Irrigation Systems	4	3 / 4
(CLF6454)	Drip Irrigation Systems	2	3 / 4
(CLF6455)	Conserving Water in Irrigation	1	3 / 4
(CLF6499)	Unit Exam	1	3 / 4
	TOTAL TIME FOR UNIT = 10		

UNIT GOAL: Students will demonstrate a basic knowlege of the management practices necesary for ornamental plant irrigation and drainage.

UNIT OBJECTIVES: Upon completion of this unit, students will be able to:

1. Define the terms irrigation and drainage.
2. Explain the importance of good drainage in the planting of ornamental crops.
3. Identify three ways to determine when to irrigate (e.g., looking at plants, considering the possibilities for evapotranspiration, and using a tensiometer).
4. Identify the advantages and disadvantages of various systems of irrigation used in ornamental horticulture (e.g., sprinkler, bubbler, drip, and so forth).
5. Describe factors which determine water penetration.
6. Demonstrate how to test for soil moisture content by touch.

REFERENCES:

Ball, Vic. (Ed.). (1985). BALL RED BOOK. (14th ed.). Reston, VA: Reston Publishing Company.

Hartmann, H. T., Flocker, W. J., & Kofranek, A. M. (1981). PLANT SCIENCE: GROWTH, DEVELOPMENT, AND UTILIZATION OF CULTIVATED PLANTS. Englewood Cliffs, NJ: Prentice-Hall.

Hausenbuiller, R. L. (1972). SOIL SCIENCE: PRINCIPLES AND PRACTICES. Dubuque, IA: Wm. C. Brown Company.

Landphair, H. C., & Klatt, F., Jr. (1979). LANDSCAPE ARCHITECTURE CONSTRUCTION. New York: Elsevier Science Publishing Company.

Editors of Sunset Books and Sunset Magazine. (1984). LANDSCAPING ILLUSTRATED. Menlo Park, CA: Lane Publishing Co.

Editors of Sunset Books and Sunset Magazine. (1989). WATERWISE GARDENING. Menlo Park, CA: Lane Publishing Co.

Editors of Sunset Books and Sunset Magazine. (1988). WESTERN GARDEN BOOK. Menlo Park, CA: Lane Publishing Co.

Wilson, Scott. (1976). LANDSCAPE CONSTRUCTION. San Luis Obispo, CA: California Polytechnic State University, Vocational Education Productions.

RESOURCES:

East Bay Municipal Utilities District, P.O. Box 24055, Oakland, CA 94623 (415) 835-3000: Numerous publications on water conserving landscaping.

Sunset Magazine, Lane Publishing Company, Menlo Park CA, 94025: Publications and reprints on water conservation.

Urban Farmer Store, 2833 Vicente Street, San Francisco, CA 94116 (415) 661-2204: Drip irrigation supplies and information.

Attachment B – Community College Curriculum

CCAG 355 Landscape Irrigation

Hours/Wk. - Lecture 2.0 Lab: 3.0 (18 week semester)

Catalog Description:

This course prepares students to design, install and maintain a water efficient landscape irrigation system. Topics include water supply, basic hydraulics, component identification and terminology, system layout, pipe sizing; types of heads, valves, controllers.

Prerequisites: None

Objectives:

Students will:

- Outline California's water storage and delivery system
- Identify the percent of the state's developed water supply used for landscape irrigation
- Describe how irrigation water is made available to plants through the soil
- Identify system components on an irrigation plan
- Define the basic concepts of water pressure, flow, velocity and friction loss
- Calculate water pressure and flow at key points in a system
- Explain the function of backflow prevention devices
- Describe the major types of sprinkler heads, valves and controllers
- Space sprinkler heads for uniform application and specified precipitation rate
- Select pipe material based on use, water pressure, and flow
- Identify and select pipe fittings
- Specify heads, emitters, valves, backflow prevention and controller for a residential landscape
- Work with others to install PVC pipe, low volume tubing and emitters, sprinkler heads, remote control valves, backflow prevention devices and controller
- Program a controller for water-efficient system operation
- Determine the need for pumping/filtering irrigation water from city mains and private wells
- With a small group, perform a water audit to determine system efficiency
- Troubleshoot and solve irrigation system problems
- Prepare and present a cost estimate for an irrigation system
- Identify professional organizations and certification pertaining to landscape irrigation

Content:

1. California's climate and water resources
   a. California's Mediterranean climate pattern
   b. Importance of winter rainfall and storage facilities
   c. Regional and local water distribution systems
   d. Statistics on landscape water use

2. Basic hydraulics and water movement through pipe
   a. Static pressure
   b. Dynamic (operating) pressure
   c. Flow (GPM)
   d. Velocity
   e. Friction loss
   f. Calculation of water forces at key system points

3. Soil and plant water relations
   a. Soil types and drainage/aeration characteristics
   b. Soil water holding capacity and rooting depth
   c. Water use of plant types
   d. Evapotranspiration concept and reference ET
   e. Infiltration rates of soils

4. Water supply
   a. City mains and service lines
   b. Wells, pumps and storage facilities
   c. Water quality
   d. Alternative water sources

5. Assembly methods and installation of system components
   a. Sprinkler heads and nozzles
   b. Manual and remote control valves
   c. Backflow prevention devices
   d. Pressure regulators
   e. Controllers

6. Pipe and fittings
   a. PVC pipe
      (1) Class and schedule
      (2) Nomenclature of fittings and connectors
      (3) Tools, cements, glues, tapes
      (4) Assembly and installation
   b. Polyethylene pipe
      (1) Nomenclature of fittings and connectors
      (2) Drip and low volume tubing, emitters, and sprayers
      (3) Retrofit adapters

(4) Assembly and installation

c. Galvanized steel pipe
   (1) Nomenclature of fittings and connectors
   (2) Tools, thread compounds, tapes
   (3) Assembly and installation

d. Copper pipe
   (1) Nomenclature of fittings and connectors
   (2) Tools, solder, flux
   (3) Assembly and installation

7. System planning and layout
   a. Available water pressure and flow at point of connection
   b. Watering zones (hydrozones)
   c. Head selection and placement
   d. Precipitation rates and head spacing
   e. Circuiting heads into valve groups
   f. Location of valves, main lines and lateral lines
   g. Sizing valves and pipe
   h. Location of controller and sizing power and valve wires
   i. Controller programming and system operation check

8. Estimating costs
   a. Irrigation plan reading and standard symbols
   b. Material take-off
   c. Supplier catalogs and price lists

9. Water-efficient system operation
   a. Water audit method of determining system efficiency
   b. Use of California Irrigation Management Information System (CIMIS) and other ET data resources
   c. Implementation of ET data in controller programming
   d. Troubleshooting problems
   e. Adjustments and repairs
   f. Local water agency assistance and resources

10. Professional groups and activities
   a. California Landscape Contractors Association
   b. Irrigation Association
   c. Certified Landscape Technician of Irrigation exam

Texts/References:

Shepersky, K., Ed. (1998). Landscape Irrigation Design and Specifications. Rain Bird Sales.

California Landscape Contractor Association (1998). California Landscape Standards. CLCA, Sacramento, CA.

Watkins, James A. (1987). Turf Irrigation Manual. Telsco Industries, Dallas, TX.

CCAG 650 Irrigation

Hours/Wk. - Lecture: 2 Lab: 3 (18 week semester)

Units: 3

Catalog Description:

This course involves the principles and practices of California water delivery will be covered. Basic topics of plant-soil-moisture relationships and water movement in the soil, water quality, water law, measurement of water, evaluation of irrigation methods, systems, wells and pumps will be included.

Objectives:

The student will:

- Be able to describe the importance of irrigation water in agriculture and defend its continued supply.
- Have an awareness of the many problems facing California agriculture in a period of limited water supply and worsening water quality. Students should be able to list the consequences of management decisions on this limited resource.
- Be able to define correctly the most common irrigation terminology.
- Be able to differentiate between State vs. Federal water and projects, water vs. irrigation district.
- Be able to demonstrate a complete understanding of the soil-plant-water relationship by correctly completing a soil water budget.
- Be able to calculate evapotranspiration rates for crops common to California over a complete growing season.
- Be able to compare and install all the major water supply systems (i.e. surface, sprinkler, drip, and micros). Surface as well as buried systems.

Content:

I. The Importance of Irrigation Management

II. Irrigation Terms

III. Sources of Irrigation Water
  A. State/federal supply systems
  B. Irrigation/water districts
  C. Water laws/rights
  D. Costs of water (pumps vs. district)

IV. Plant-Soil-Water Relationships
  A. Water cycle

B. Plant/water relations
C. Soil/water relations
D. Available soil water
E. Evapotranspiration

V. Irrigation Water Management
A. Measuring irrigation water
B. Soil moisture deficiency
C. Irrigation efficiency
D. Irrigation scheduling

VI. Crop Irrigation
A. Generalized crop curves
B. Irrigation practices of specific crops

VII. Irrigation Delivery Systems Management and Evaluation
A. Flood, basin, furrow
B. Sprinklers
C. Drip
D. Micro systems
E. Miscellaneous irrigation methods
F. Pumps and wells

Texts/References:
Text list not completed.

Appendix C – Applicant Resumes

Leimone Cerise Waite

EDUCATION

CALIFORNIA POLYTECHNIC STATE UNIVERSITY, *San Luis Obispo, CA*
Masters degree in General Agriculture. June, 1999

UNIVERSITY OF CALIFORNIA, DAVIS, *Davis, CA*
Single subject and Specialist Credential in Agriculture. June, 1994
Bachelor of Science, Agricultural Education. June, 1993

COLLEGE OF THE SISKIYOUS, *Weed, CA*
Certificate of Communications. May, 1991
Associate of Science. May, 1990. (Graduated with honors)

RELATED SKILLS

- Certified Agricultural Irrigation Specialist, Irrigation Association. November, 2000.
- Certified Landscape Irrigation Auditor, Irrigation Association. November, 2000
- Certified Irrigation Designer-Residential, Irrigation Association. February, 2003

EDUCATION EXPERIENCE

SHASTA COLLEGE, REDDING, CA

Horticulture Instructor, *August 1998- Present*
Teach courses in Soils, Landscape Irrigation, Agriculture Irrigation, Agricultural Mechanics, Plant Propagation, Nursery Management, Landscape Maintenance, Horticulture Careers and other Horticulture related courses. Responsible for the maintaining, irrigating and managing six greenhouses and a one acre arboretum. Other duties include overseeing worksite learning and internships, writing and reviewing horticulture curriculum, serving on college curriculum committee, the Institutional Tenure Review Committee and advising Horticulture students.

MT. LAKES HIGH SCHOOL, REDDING, CA

Agriculture Teacher, *July, 1997 - June 1998*
Wrote and implemented curriculum in Agriculture Science, Soil Science, Environmental Science, Horticulture, Floriculture and Agriculture Construction. Other activities included: refurbishing and reviving the greenhouse; installing irrigation systems; coordinating the job shadowing competency; and leading FFA and community service projects.

WASCO UNION HIGH SCHOOL, *WASCO, CA*

Agriculture Teacher*, July, 1994 - June, 1997*
Responsible for instruction in Agriculture Science, Soil Science, and Horticulture. Also developed new hands on curriculum for Agriculture Science, Soil Science, Horticulture and Ag Biology . Other duties included: Leader of FFA projects in Horticulture and livestock; coaching of FFA judging teams; organizing several FFA contests, supervising leadership activities; and co-management of a 130 acre school farm. Solely responsible for rejuvenating the school greenhouse and shade house, launching a Horticulture Program and articulating it with Bakersfield college.

DOUGLAS JUNIOR HIGH SCHOOL, *WOODLAND, CA*

***Student Teaching Intern**, April, 1994 - June, 1994*
Taught plant science using lab stations to teach plant growth, soil science and land conservation. Also instructed students in proper welding procedures using both oxy-acetylene and arc welders.

TOKAY HIGH SCHOOL, *LODI, CA*
***Student Teacher**, August, 1993 - January, 1994*
Responsible for teaching and writing curriculum for courses in General Agriculture I and II, Agricultural Economics and Agriculture for level one ESL students. Used gardening to teach hands-on agriculture science.

AGRICULTURAL EXPERIENCE

FORREST LANE RANCH, *Orick and Montague, CA*
***Wrangler, Irrigator and Cowgirl**, Seasonal from 1986 - 1991*
Work included the irrigation of hay and pasture, care of 200+ head of cattle, training young horses to ride and the general care of the ranch when employer was absent.

SKUNK RANCH, *Hyampom, CA*
***Ranch manager**, 1983 - 1990*
Fully responsible for the production and financial management of fifty head of beefalo cattle. Duties included fencing, care of cattle and horses, management of rangeland, record keeping, developing specialty markets and purchasing ranch supplies.

LANE'S PACK STATION, *Orick and Montague, CA*
***Head Mule Packer, Manager and Cook**, April, 1985 - August, 1989*
Duties included: Planning, organizing, and supervising pack trips into the wilderness, planing and cooking camp meals, shoeing and care of 50+ head of horses and mules, and the development of advertisements and booking of reservations.

AWARDS

- Recipient of the Agriculture Teacher Enhancement Scholarship, the Brad Davis Memorial Fellowship, and the Henry A. Jastro Scholarship.
- Runner- Up USA Today and Phi Theta Kappa All American Academic Team
- President's and Dean's lists seven times.
- California Outstanding FFA Advisor, (Gold level, 1997)

COMMITTEES AND OTHER ACTIVITIES

- Vice President, Treasurer, and Secretary of Kern/ Inyo Section, California Agriculture Teachers Association. (1994-1996)
- Co-Chair California Community College Environmental Horticulture Statewide Curriculum Review Committee (2000-Present)
- Member of the California Agriculture Teachers Association
- Member of the California Teachers Association
- Vice-Chair Career and Education Committee, California Association of Nurseries and Garden Centers. (2001-Present)
- Member of the Irrigation Association
- Member of the National Association of Agricultural Educators
- Member of the California Landscape Contractors Association
- Member of the Associated Landscape Contractors of America
- Member of the Shasta College Curriculum Committee

Michael Spiess

Education

1997-2003 U.C. Davis / CSU, Fresno

- Ed.D. Degree (Joint Doctoral Program in Educational Leadership), May 2003.

1981-1883 California State University, Fresno

- M.S. Degree (Agriculture, Plant Science), December 1983.

1977-1979 California State University, Chico

- B.S. Degree (Agriculture Major, with distinction), December 1979.

1975-1977 San Joaquin Delta College

- A.A. Degree (Natural Resources Major, with high honors), December 1977.

Experience

Fall 2003-Present California State University, Chico

Associate Professor

Teaching agricultural engineering technology, irrigation, precision agriculture, and agricultural education

Fall 1997-Spring 2003 California State University, Fresno

Lecturer

Teaching mechanized agricultural, precision agriculture, computer skills and agricultural education resources

July1999-July 2003 California State University, Fresno

Manager, Agricultural Technology Information Network (ATI-Net)

ATI-Net is an administrative division of the California Agricultural Technology Institute which develops Internet based applications.

1997-Present Peak Consulting

Owner

- Developing web sites and Internet applications for businesses and education.

1991-1997 FAMOUS, LLC

Partner

- FAMOUS, LLC is the developer of the FAMOUS Agricultural Accounting package installed at 1500 sites in over 35 states (as of 1997).
- FAMOUS is used by growers, packer-shippers, brokers, and wholesalers of produce.

1984-1997 FAMOUS, LLC

Product Manager/Customer Training and Support

- Developed curriculum for customer classes.
- Designed software changes. Planned special projects like integration of automatic faxing into FAMOUS and bar coded pallet/receiving tag systems.
- Developed and maintained the company web site and coordinated all company Internet services.
- Trained customers in the use of the FAMOUS accounting system. Job required advanced knowledge of the PC, Network, and UNIX operating systems and

accounting skills

- Developed support staff training curriculum

1981-1988 California State University, Fresno

Lecturer (Part-time)

- Taught Agricultural Shop Skills, Rural Electrification, Tractors, Welding, Fabrication, Agricultural Computing, Irrigation System Design, and Surveying.

1981-1984 CSU, Fresno / Center for Irrigation Technology

Research Assistant

- Developed computer data acquisition and control systems. Performed irrigation equipment testing, system design, and programming.

1979-1981 Biggs High School/ Sierra Joint Union High School

Vo-Ag Instructor

Courses Taught

Curriculum & Methods in Teaching Agricultural Mechanics
Agricultural Machine Systems
Irrigation
Introduction to Agricultural Mechanics
Directed Work Experience in Field and Row Crops
Introduction to Precision Agriculture

Grants, Publications, and Presentations (Abridged)

Spiess, M. 2004. Bureau of Reclamation Water Conservation Grant ($300,000) to expand existing SCADA demonstration facilities and outreach activities to the North State water districts.

Cassel, S, Zoldoske, D, Spiess, M. 2003. Assessing Spatial and Temporal Variability of Soil Salinity of Farms Implementing Drainage Management Practices. California Agricultural Technology Institute. Funded by the California Department of Water Resources.

Spiess, M. 2001. Using Remote Sensing for Crop Management. Presented at GIS Day, California State University Fresno.

Spiess, M. Yen, M., Gu, S. 2000. Feasibility Study of Remote Sensing as an Economically Viable Vineyard Management Practice. ARI Grant ($80,000). 2000-2002

Strohman, R., Spiess, M, 2000. Development of Precision Agricultural Curriculum for California Agricultural Leaders. ARI Grant ($240,000). 2000-2002

Strohman, R., Spiess, M, 1999. Development of Precision Agricultural Curriculum. USDA Challenge Grant ($240,000). 1999-2002

Other Interests

- Life member of the California Agricultural Teachers' Association.
- Member of the National Association of Agricultural Educators.
- Member of the American Association of Agricultural Educators.
- Member of the Irrigation Association.

Clint C. Cowden

Education

California Polytechnic State University, San Luis Obispo, CA

- **Master of Agriculture;** *Precision Agriculture, To be Completed* April 2005
- **Bachelor of Science**; *Agricultural Systems Management,* August 2001
  - **Minor;** Agricultural Business
  - **Concentration;** Water/Irrigation

Certified Landscape Irrigation Auditor, The Irrigation Association
Certified in SSToolbox for GIS Applications, SST Development Group

Relevant Projects

American Society of Farm Managers and Rural Appraisers, Yosemite, CA 9/02

- Prepared and presented presentation at the fall meeting for the California Chapter of ASFMRA
- Discussed "Current trends in Precision Agriculture on the West Coast:"
  Aerial imagery to detect crop stress and create regional management zones
  Tractor auto-steer to increase efficiency and reduce operator fatigue
  GPS and GIS products and their applications to farming

Pacific Wine Partners, Santa Rosa, CA 11/01

- Prepared and presented presentation to Pacific Wine Partners top 200 wine grape growers
- Discussed "Irrigation Factors that Influence Wine Grape Quality:"
  Irrigation systems maintenance and distribution uniformity
  Irrigation scheduling, evapotranspiration based, sample calculations using crop coefficients

Cal Poly State University, San Luis Obispo, CA 1994-2000

- Irrigation Association: International Meeting Attendant (1998-2000)
- National Agri-Marketing Association: Ag Student Council Representative (1997-98)
- Agricultural Student Council: Vice President (1995-96), Chairman of Faculty Recognition Banquet (1996)
- President's Council: President (1995-96)
- American Society of Agricultural Engineers: Ag Student Council Rep. (1994-95), Co-chair Tractor Pull (1995)
- Cal Poly Rodeo: Member (1994-95)

Work Experience

West Hills Community College, Coalinga, CA **7/04-Present**

Agriculture Science and Technology Instructor (55 hours/week)

- Created curriculum for Precision Agriculture certificate program
- Prepared curriculum and taught courses in Introduction to Precision Agriculture, Plant Science, Computer Applications, Soil Science, Irrigation and Advanced Precision Agriculture
- Manage 200 acre school farm with pistachios, almonds, oat hay and vegetables
- Supervise student internships

J.M. Lord, Inc., Indio, CA **7/03-7/04**

Agricultural Systems Analyst (55 hours/week)

- Consulted on irrigation frequency and duration, salinity threshold and leaching requirements, fertility, and crop suitability and feasibility in the Coachella Valley
- Scheduled 5,000 acres of dates, citrus, grapes, bell peppers, cantaloupe, artichokes, broccoli, lettuce and etc.
- Maintained site-specific information such as field boundaries, soil EC, soil moisture and fertility in ArcView
- Created curriculum and taught weekly grower courses on topics from soil identification to computer based crop modeling for irrigation scheduling

Cowden Advanced Agriculture, Coalinga, CA **12/02-7/03**

Consultant (15 hours/week)

- Scheduled and generated irrigation recommendations for 2,400 acres of cotton
- Georectified and prepared satellite imagery for clients
- Created variable rate seeding, spreading and spraying recommendations
- Interpreted and analyzed multiple years of cotton yield data for over 2000 acres

West Hills Community College, Coalinga, CA 7/02-7/03

Precision Agriculture Outreach Instructor (40 hours/week)

- Performed field studies to determine the needs of professional agriculture today
- Created curriculum and course material for precision agriculture short courses that addresses those needs
- Taught short courses to regional agriculturalists in Kingsburg, Coalinga, Salinas, Modesto and Yuba City

BioResource and Agricultural Eng. Dept., San Luis Obispo, CA 1/01-6/02

Researcher for Precision Agriculture and Irrigation (35 hours/week)

- Created on-line teaching modules intended to instruct junior college professors about precision ag equipment
- Generated lessons about GIS software to generate variable rate prescriptions
- Conducted on-site instruction to junior college professors on the use of variable rate applicator and how this technology would apply to local farming
- Created a computer model to estimate soil moisture tension for different soil types
- Generated "Effects of Irrigation Scheduling on Precision Irrigation" for the Precision Irrigation web site

Irrigation Water Management, San Luis Obispo, CA Fall 2001

Teaching Assistant (15+ hours/week)

- Lectured on irrigation systems (center pivots, linear move sprinklers, hand-move sprinklers, and micro)
- Generated and corrected all exams and homework; reviewed rough drafts and graded term papers
- Administered and taught large group study sessions; conducted regular office hours

Wyatt Irrigation, Napa, CA 3/00-9/00

Head Agricultural Irrigation Designer for the Napa Valley (60 hours/week)

- Designed drip, frost and micro-frost irrigation systems for vineyards
- Troubleshot existing irrigation systems to increase performance and uniformity
- Performed outside Ag. Sales
- Created communication links with new customers to insure the highest customer satisfaction
- Consulted farmers on irrigation techniques that minimize costs and improve crop quality and production

Ernest & Julio Gallo Sonoma, Healdsburg, CA Summer/Fall 1999

Intern-Viticulture Technician (60 hours/week)

- Designed drip and frost protection systems for 46 acre private reserve vineyard
- Created irrigation systems maintenance program
- Supervised irrigation evaluations on all 2000 acres of Gallo Sonoma Vineyards
- Managed special projects and performed miscellaneous vineyard, winery and winemaking operations

Water Wise Systems, San Jose, CA Summer/Winter 1998 Fall/Winter 1999

Intern-Engineer's Assistant (50 hours/week)

- Evaluated new job sites and prepared job estimates for clients
- Analyzed irrigation systems and executed required adjustments to maximize irrigation uniformity
- Managed a crew of 10 employees

Joy Cowden

Education

California Polytechnic State University – San Luis Obispo, CA

- **Master of Agriculture;** *Agriculture Engineering Technology, To be Completed June 2005*
- **Bachelor of Science;** *Agricultural Systems Management***,** *August 2001*
  Concentration; *Water/Irrigation*
  Minor; Agribusiness
- **Certified Irrigation Golf Course Auditor,** *Irrigation Association*

Work Experience

West Hills Community College, Coalinga, CA September 2004 – Present
GPS Project Coordinator

- Assist in curriculum preparation for Precision Agriculture certificate program.
- Maintain GPS equipment and prepare instructional laboratories.
- Oversee campus farm activities and supervise student labor.
- Administer $200,000 workforce development irrigation grant.

J.M. Lord, Inc, Indio, CA July 2003-August 2004
Agricultural Systems Analyst

- Consulted on irrigation frequency and duration, salinity threshold and leaching requirements and fertility in the Coachella Valley.
- Scheduled 2,000 acres of bell pepper, cantaloupe, watermelon, tomato, artichoke, broccoli, and lettuce.
- Maintained site-specific information such as field boundaries, soil EC, soil moisture and fertility in ArcView for 50,000 acres.
- Created curriculum and taught weekly grower courses on topics such as irrigation uniformity and system maintenance.

RJG Consulting, Coalinga, CA January 2003-Present
GIS Specialist

- Georectified and prepared satellite imagery for clients.
- Created variable rate seeding, spreading and spraying recommendations.
- Interpreted and analyzed multiple years of cotton yield data for over 2000 acres.
- Generated soil sampling schemes and instructed clients on the proper use of handheld GPS units and software.
- Maintained GIS database on over 50,000 acres.

West Hills Community College, Coalinga, CA June 2002-January 2003
GPS Technician

- Created course material for grower precision agriculture short courses.
- Assisted in grower short course instruction and maintained and prepared GPS equipment.
- Assisted with farm manager operations on cotton, alfalfa, pistachios and almonds.

Agriculture Safety Institute (AgSI), San Luis Obispo, CA January 2001-June 2002
Assistant to the Director

- Arranged and coordinated industry short courses.
- Maintained budget and records using Quicken and People Soft.
- Prepared short course proceedings and presentations.

Precision Agriculture Institute, San Luis Obispo, CA January 2002-June 2002
Research Assistant
- Created on-line teaching modules intended to instruct junior college professors about precision agriculture.
- Used SSToolbox (GIS software) to generate variable rate spray prescriptions.
- Mapped field boundaries using Trimble AgGPS 170.

Wyatt Irrigation Supply Inc., Santa Rosa, CA Summer 2000
Assistant Designer/Intern
- Assisted head irrigation designers both in Napa and Sonoma Counties.
- Gathered field dimensions and elevations required for proper design of irrigation systems.
- Consulted with growers and designed drip and micro frost irrigation for vineyards with AutoCAD 14.
- Evaluated and corrected irrigation systems to insure proper functioning of valves, filters and etc.

Irrigation Training and Research Center, San Luis Obispo, CA April 1999 – June 2000
Student Employee
- Welded tripods for sprinkler irrigation evaluations.
- Performed irrigation on school research field.
- Converted film slides to digital images using Thumbs 4.0.

U.S. Bureau of Reclamation/ITRC, Northern California Summer 1999
Field Consultant
- Performed distribution uniformity tests on undertree and side roll sprinklers and drip/micro irrigation systems.
- Evaluated irrigation systems in Chico, Dunnigan, Glenn-Colusa, Glide-Kanawha and M & T Irrigation Districts.
- Consulted farmers on current system performances.